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Northwestern Ontario Boreal Forest Management

Technical Notes

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SEDIMENT CONTROL PLANS: REDUCING SEDIMENT CONCERNS AT WATER CROSSINGS

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INTRODUCTION

Sediment control planning is a new technology to minimize sedimentation concerns during construction of water crossings on forest access roads.

In recent years in Ontario there have been significant improvements in the way water crossings are designed, built, and maintained. The *Environmental Guidelines For Access Roads and Water Crossings* (OMNR 1988) were introduced and hundreds of Ontario Ministry of Natural Resources (OMNR) and forest industry staff have been trained in water crossing construction techniques.

Sediment control plans can minimize sedimentation problems during construction of water crossings.

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With training, it is not difficult to recognize a satisfactory completed crossing. Protection of vegetation, good culvert elevation for fish migration, adequate pipe length, stable side slopes and erosion protection are all objective criteria that can be explained to equipment operators and measured by the OMNR.

There is still some subjectivity involved in assessing the short-term impacts of construction. Although the final product must not be a chronic source of sediment entering the water, there is also concern about construction techniques that cause short-term sediment. OMNR has learned through compliance monitoring that good planning and control of operations are needed to keep short-term impacts within acceptable limits.

Sediment control planning provides clear instruction to on-site workers on methods to minimize sedimentation during construction. The concept was developed in the United States and Southern Ontario for land development projects. During 1991, sediment control plans have been used successfully in Northwestern Ontario on projects built by OMNR, Canadian Pacific Forest Products, Boise Cascade and TransCanada Pipelines. This report outlines the process of writing, implementing, and monitoring a sediment control plan.

WHY IS SEDIMENT HARMFUL TO FISH

Sediment is defined as soil particles deposited into lakes and streams through the process of erosion. Sediment is transported as suspended sediment or by rolling along the stream bottom (bedload) (Ward 1992).

Sediment can be harmful to fish because it reduces food productivity, kills eggs and larvae, and destroys spawning beds. High levels of suspended sediment can cause direct mortality (Ward 1992). For a more complete discussion of the impacts of sediment on fish, see Ward (1992).

WHAT IS A SEDIMENT CONTROL PLAN?

A sediment control plan consists of a written description of what on-site activities will take place and the measures to be used to control sediment at each step of a construction project. It is prepared before construction begins so potential problems or hazards are anticipated and measures specified for erosion and sediment control. The plan should be written for expected stream flow conditions but allow for the possibility of high waters caused by storm events. There must be flexibility for the author to change the plan during construction if improvements can be made.

Through the plan, the applicant and the OMNR agree ahead of time about what is expected to occur during construction and the mitigation techniques that will be used. This will provide a benchmark for monitoring construction operations.

The use of sediment control plans complements existing guidelines and design review procedures. In critical fish habitat, sediment control plans build on the concepts and information contained in the *Environmental Guidelines for Access Roads and Water Crossings* (OMNR 1988).

WHO WRITES THE PLAN?

The designer or builder writes the sediment control plan. The OMNR reviews and approves the plan as part of the application for a Work Permit.

WHY HAVE A PLAN?

A sediment control plan benefits both the OMNR and the builder because practical problems and available solutions are considered before the problems are encountered. The planning process encourages communication among the plan author, construction staff, the reviewer, and those monitoring construction. The pooling of ideas and experiences usually results in a better plan.

The plan will define expectations during construction operations and on-site staff will be accountable for plan implementation. Monitoring will focus on compliance with the plan requirements and revisions implemented during construction. All parties will know exactly what is expected during each phase of construction, how it will be done, and by whom.

WHEN ARE PLANS NEEDED?

Sediment control plans are not needed for all stream crossings. For routine crossings, adherence to environmental guidelines and Work Permit conditions will ensure adequate protection of water quality and fish habitat.

Sediment control plans are recommended for sites which are particularly sensitive to disturbance, such as near spawning or nursery areas, which could be damaged by uncontrolled construction activities in or near the water.

The need for a sediment control plan will normally be decided by the OMNR district office. This will be done on a case-by-case basis - there are no specific criteria for deciding when a plan is needed. In some cases, the use of a sediment control plan will allow greater freedom for the builder. For example, timing restrictions may be waived if sedimentation concerns are adequately addressed in a plan.

Examples where sediment control plans have been used include the Dead Creek bridge in Nipigon District which spanned a walleye spawning bed, a culvert crossing on the North Road in Red Lake District where downstream water quality was a concern, a pipeline crossing of the Pagwachuan River which involved digging in the stream bed, and reconstruction of the Steep Rock Dam.

WHAT DOES A PLAN LOOK LIKE?

Plans generally incorporate both written text and sketches showing mitigation measures at each phase of construction.

There are four broad categories of sediment control measures that need to be considered in formulating a plan for a particular water crossing (not all measures will apply for all crossings):

1. **ADMINISTRATIVE MEASURES** could include:
   - purchasing adequate pipe length,
   - training and instruction of workers,
   - timing the construction to avoid spawning periods,
   - designating one individual responsible and accountable,
   - inspection frequency,
   - contingency plan to follow in case of change, and
   - limiting duration of in-water work.

2. **PROTECTION**:
   - protect the existing ground cover,
   - limit the area of disturbance to reduce the area requiring stabilization.

3. **STRATEGIC PLANNING OF OPERATIONS** - Develop a sequence of operations to manage factors affecting sediment entering the creek or river:
   - storm water flowing towards the creek,
   - access to the far shore (ford, temporary bridging),
   - what happens to creek flows during construction (eg temporary diversion, blocked flow),
   - careful selection of material sources,
   - early stabilization of creek banks,
   - scheduling material delivery, equipment, and workers to minimize duration of construction disturbance,
   - use of short-term erosion control until long-term measures are effective.

4. **STRUCTURAL CONTROLS** - There are numerous mitigation techniques available for reducing sediment including diversion berms, check dams, slope trimming, rip rap, silt fences, sediment traps, brush mulch, erosion control blankets, seed and fertilizer. These are described in the *Environmental Guidelines for Access Roads and Water Crossings* (OMNR 1988). The pros and cons of each treatment are considered and the most appropriate techniques for a particular site are selected and shown on a drawing (Fig. 1).

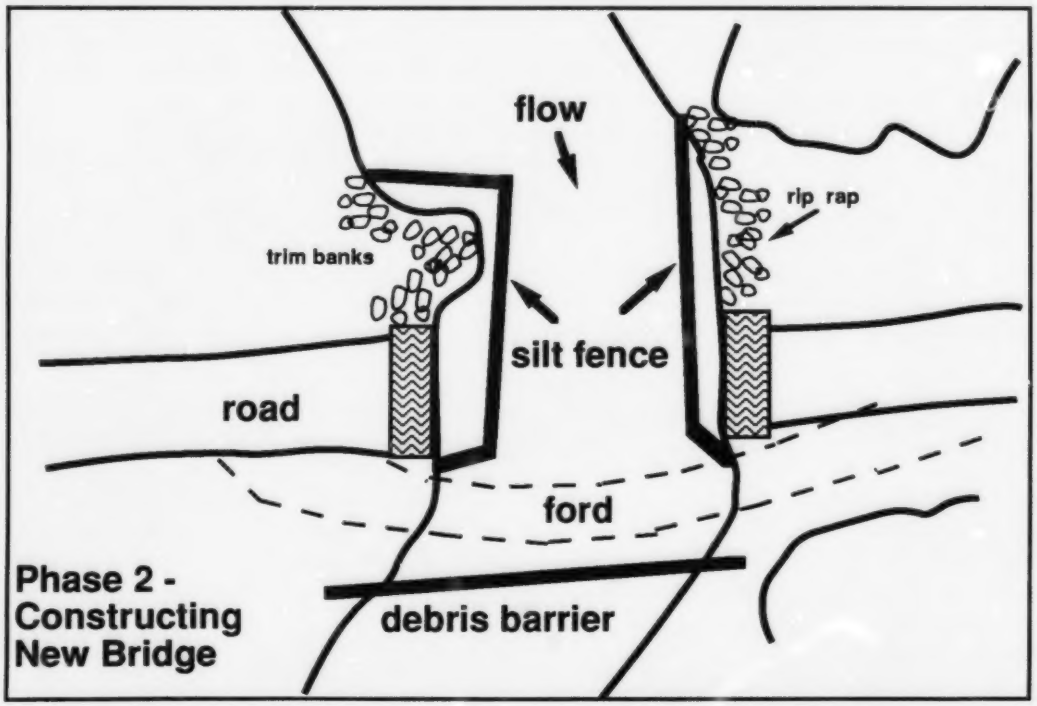

Figure 1. Example drawings from Sediment Control Plan, MNR Arrow River Bridge.

A CHECKLIST OF PLAN CONTENTS:

Project Description • brief description of the proposed construction and the plan objectives.

Existing Site Conditions • description of the existing topography, vegetation, soils, site drainage patterns, streambed material, streamflow, width, depth, velocity.

Critical Areas • description of downstream values that could be adversely affected by serious erosion or sediment problems (eg spawning bed, nursery habitat), • location where sediment will eventually deposit downstream (eg lake or slow water).

Administration • Administrative measures to ensure satisfactory plan implementation; for example, timing of construction outside spawning/incubation period, frequency of site inspection, contractor input to the plan, training of workers, on site inspections with OMNR.

Construction Operations • description of each construction operation in chronological sequence, occasions when sediment will enter water, and the measures that will be taken at each step to control erosion and sediment:

- proposed construction time frame,
- pre-disturbance control measures (eg silt fences),
- clearing and preparation of work areas,
- water flow management during construction for:
  - surface water flowing towards the creek
  - streamflow during construction through/around work areas
- access to the far shore,
- structure construction staging,
- fill placement in floodplain (type, method), and
- long term erosion control techniques.

Contingency Plan • What process will be followed if revisions are needed? The plan author should approve any changes. If necessary, an action plan could be set out to deal with emergencies (eg. severe rain, flood flows).

Accountability • The names, positions and phone numbers for those responsible for plan implementation. They should include the on-site construction foreman and inspector.

Inspection and Maintenance • An inspection schedule and expected maintenance requirements for erosion and sediment control measures (eg inspection and correction of deficiencies the following spring).

A drawing or sketch of the work-site showing work phases and mitigation measures.

A CASE STUDY: THE ARROW RIVER BRIDGE

In 1991, an old bridge over the Arrow River was replaced. It had been built of untreated wood and had decayed to the point where it was unsafe for traffic. Since the bridge was on a fish migration route and upstream from a walleye spawning bed, it was decided that a sediment control plan would be helpful to deal with potential problems in advance of construction (OMNR 1991).

After analysis of expected flood flows and review with fisheries staff and the construction contractor, the following mitigative techniques were chosen:

- a debris barrier to trap floating material downstream from the bridge;
- silt fences enclosing work areas on both banks;
- a ford for machinery to cross the stream while the bridge was down. The number of crossings was limited to 12.
- the banks to be trimmed to a stable angle and rip rap installed;
- brush mulch and seed and fertilizer applied to disturbed areas.
- existing vegetation on river banks to be preserved where possible.

Administrative measures included:

- timing the construction for late summer, outside the walleye spawning and incubation period.
- ensuring that an inspector was appointed and that the contractor and inspector were accountable for seeing that the plan was followed. The inspector was to be on-site daily.
- limiting the competition to experienced contractors.
- approving the construction materials to be used.

The measures were put on a construction drawing and the plan was written describing the sequence of events expected (Figure 1). The staff time required to prepare the plan consisted of an initial one day visit to the site, one day writing the plan, and another one day visit with the contractor. During the construction period (approximately two weeks), an OMNR inspector was on site daily.

The plan was considered effective at minimizing the amount of sediment entering the river and the final water crossing was stable. No long-term sediment problems are anticipated.

SUMMARY

Recent experience with sediment control plans showed they can reduce conflict at water crossing sites. The main advantage of the process is improved communication and discussion between the builders and the OMNR about exactly what will occur during construction and the measures to be taken to control sediment.

It takes time and effort to prepare a good plan, but sediment control plans can be a useful tool for large projects or where critical fish habitat could be seriously damaged by sediment.

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OTHER RECOMMENDED MATERIAL

Nova Scotia Dep. of the Environment. 1988. Erosion and sedimentation control handbook for construction sites. Education and Technical Training Branch. Halifax.

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